Black Horse Pike Regional School District
580 Erial Road, Blackwood, NJ 08012

Design and Technology I

COURSE OF STUDY

Technology Department

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DESIGN & TECHNOLOGY I

2026-2027 School Calendar

1. Intro Design Challenge
2. Intro to Digital Design and 3D Printing (suggested TinkerCAD)
3. Measurement and Layout
4. Machine, Tool, and Lab Safety + Hands-On Build Projects
5. The Design Process - Hands-On Design Challenge
6. BHPRSD District Tech Challenge
7. Advanced Digital Design and 3D Printing (Suggested Fusion and/or Onshape)
8. Egg Drop + Egg Crash/Maglev Car Design Challenge
9. Civil Engineering - Bridges + Intro to AutoCAD
10. Rocketry and Aeronautics

September '26

Su	M	Tu	W	Th	F	S
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October '26

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November '26

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December '26

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January '27

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31						

February '27

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28						

March '27

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April '27

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June '27

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DESIGN & TECH I

BLACK HORSE PIKE REGIONAL SCHOOL DISTRICT

2026-2027 Course Syllabus

COURSE DESCRIPTION

9-12 Graders - No Pre-Requisite Required
5 Credits

In Design & Tech I, students use the Engineering Design Process to plan, build, and test prototypes for a variety of fun, hands-on and engaging design challenges. This class is equal parts designing and building, which means that students spend just as much time planning, sketching, and designing by hand and on the computer as they do in the lab building their designs and prototypes. Students learn how to use tools and machines safely and must pass a safety quiz on each machine before they are permitted to use it. Projects start out simple and somewhat cookie-cutter in the beginning of the year, but progressively get more open ended, which really tests student's creativity and problem thinking skills.

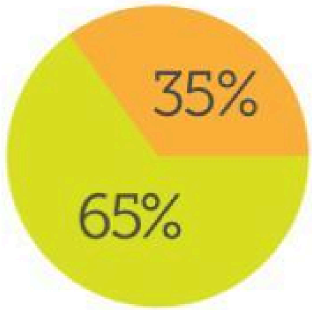
UNITS COVERED

- Measurement
- Machine, Tool and Lab Safety
- Engineering Drawings
- 3D Modeling & Rapid Prototyping
- Manufacturing and Materials Processing
- BHPRSD TECH CHALLENGE
- AutoCAD Basics
- Civil/Structural Challenge - Bridge Design
- Automotive Design Challenge - Egg Car
- Rocketry and Aeronautics
- Real-world, FUN, hands-on design challenges!

MATERIALS NEEDED

- Pencil
- Two-Pocket Folder
- Safety glasses (supplied)

GRADING



CLASSWORK (65%): Anything you make or produce falls under this category including written assignments, quizzes, sketches and brainstorming activities, any computer-based work, and anything you build from your prototypes to your final designs.

PARTICIPATION (35%): You are expected to actively participate each and every day. Over a third of your grade is participation! Below are some pointers to help you succeed in class and earn full participation points every week.

LATE WORK

- Late work is -10% each day each day it is late, up to -50% (5 days late). Work can still be turned in after that, but will be -50%.
- Work more than two weeks late will not be accepted
- Up to teacher discretion.

ATTENDANCE

- If you are absent, or plan on being absent, it is your responsibility to see me during common time or email me and check Google Classroom.
- You will get extensions on assignments equal to the number of days you were out.
- You must arrive to class BEFORE the bell rings to be marked present. If you arrive after the bell, you are late to class.

TOP 10 WAYS TO EARN FULL PARTICIPATION POINTS

1. Keep quiet and pay attention during lectures, lessons and demonstrations
2. Ask questions if you're not sure what to do. If I am busy with someone else, try and look up the answer on your own or ask a classmate or partner (try to figure it out)
3. Each class we will have daily/weekly checkpoints. Make sure you know what they are and work to meet those checkpoints
4. When prompted to get to work, you should get to work within just a couple minutes. Any longer and you will lose participation points
5. Be productive and try your best. You should be working on your projects for this class for the majority of the period. Breaks are ok, but should be short and limited
6. Use school appropriate language and be mindful of your classmates
7. Follow BHPRSD cell phone and electronics policy
8. Arrive to class on time, prepared with all necessary materials and sit in your seat
9. Use tools, machinery, and classroom equipment correctly and safely
10. Have fun!

DESIGN & TECHNOLOGY DEPARTMENT
PERFORMANCE CHART

	ADVANCED	PROFICIENT	BELOW AVERAGE
GRADING GUIDE	A	B-C	D-F
EFFORT AND USE OF CLASS TIME (Group or Individual)	Extra effort during and after class time is put into project. Student(s) modeled exceptional behavior, were always on task, followed all safety rules, and helped others.	Consistent effort is put into the project during class time. Student(s) modeled good behavior, but was not always on task and misused equipment.	Inconsistent effort during class time. Student(s) did not use class time wisely, misused tools and machinery, and, as a result, missed checkpoints, deadlines and due dates.
ACCURACY AND NEATNESS	Project is prepared neatly and carefully. All measurements are accurate. Project is aesthetically pleasing and well built.	Project is fairly neat. Measuring is mostly accurate. Project is good. There is room for improvement.	Project is prepared with little care and lacks neatness. Project looks rushed and doesn't work as intended. Lots of room for improvement.
CREATIVITY	Project is original and imaginative. Design is unique, innovative and well thought out.	Project has some original elements. Design is somewhat clever but not entirely unique.	Project lacks creativity and thought. Design is not original and is more or less a copy of an existing one.
FOLLOWING INSTRUCTIONS, SPECIFICATIONS AND CONSTRAINTS	All project instructions have been followed. Every requirement has been met and exceeded.	Some project instructions and requirements met, but not all.	The majority of project instructions and requirements were not followed, have not been met, and project is incomplete.
DEMONSTRATES UNDERSTANDING	Student is extremely knowledgeable of project concepts and is able to help others.	Student displays knowledge of most concepts, methods and/or practices involved in the project.	Student lacks knowledge about project concepts, methods and practices.

9.3 – Career & Technical Education (CTE)
Content Area: 21st Century Life and Careers

CONTENT AREA:	*STANDARD 9.3 CAREER AND TECHNICAL EDUCATION*
ARCHITECTURE & CONSTRUCTION CAREER CLUSTER®	
Number	**Standard statement**
By the end of Grade 12, Career and Technical Education Program completers will be able to:	
CAREER CLUSTER®:	*ARCHITECTURE & CONSTRUCTION (AC)*
9.3.12.AC.1	Use vocabulary, symbols and formulas common to architecture and construction.
9.3.12.AC.2	Use architecture and construction skills to create and manage a project.
9.3.12.AC.3	Comply with regulations and applicable codes to establish and manage a legal and safe workplace.
9.3.12.AC.4	Evaluate the nature and scope of the Architecture & Construction Career Cluster and the role of architecture and construction in society and the economy.
9.3.12.AC.5	Describe the roles, responsibilities, and relationships found in the architecture and construction trades and professions, including labor/management relationships.
9.3.12.AC.6	Read, interpret and use technical drawings, documents and specifications to plan a project.
9.3.12.AC.7	Describe career opportunities and means to achieve those opportunities in each of the Architecture & Construction Career Pathways.
PATHWAY:	*CONSTRUCTION (AC-CST)*
9.3.12.AC-CST.1	Describe contractual relationships between all parties involved in the building process.
9.3.12.AC-CST.2	Describe the approval procedures required for successful completion of a construction project.
9.3.12.AC-CST.3	Implement testing and inspection procedures to ensure successful completion of a construction project.
9.3.12.AC-CST.4	Apply scheduling practices to ensure the successful completion of a construction project.
9.3.12.AC-CST.5	Apply practices and procedures required to maintain jobsite safety.
9.3.12.AC-CST.6	Manage relationships with internal and external parties to successfully complete construction projects.
9.3.12.AC-CST.7	Compare and contrast the building systems and components required for a construction project.
9.3.12.AC-CST.8	Demonstrate the construction crafts required for each phase of a construction project.
9.3.12.AC-CST.9	Safely use and maintain appropriate tools, machinery, equipment and resources to accomplish construction project goals.

9.3 – Career & Technical Education (CTE)
Content Area: 21st Century Life and Careers

CONTENT AREA:	*STANDARD 9.3 CAREER AND TECHNICAL EDUCATION*
ARCHITECTURE & CONSTRUCTION CAREER CLUSTER®	
Number	**Standard statement**
PATHWAY:	***DESIGN/PRE-CONSTRUCTION (AC-DES)***
9.3.12.AC-DES.1	**Justify design solutions through the use of research documentation and analysis of data.**
9.3.12.AC-DES.2	**Use effective communication skills and strategies (listening, speaking, reading, writing and graphic communications) to work with clients and colleagues.**
9.3.12.AC-DES.3	**Describe the requirements of the integral systems that impact the design of buildings.**
9.3.12.AC-DES.4	**Apply building codes, laws and rules in the project design.**
9.3.12.AC-DES.5	**Identify the diversity of needs, values and social patterns in project design, including accessibility standards.**
9.3.12.AC-DES.6	**Apply the techniques and skills of modern drafting, design, engineering and construction to projects.**
9.3.12.AC-DES.7	**Employ appropriate representational media to communicate concepts and project design.**
9.3.12.AC-DES.8	**Apply standards, applications and restrictions pertaining to the selection and use of construction materials, components and assemblies in the project design.**
PATHWAY:	***MAINTENANCE/OPERATIONS (AC-MO)***
9.3.12.AC-MO.1	**Recognize and employ universal construction signs and symbols to function safely in the workplace.**
9.3.12.AC-MO.2	**Use troubleshooting procedures when solving a maintenance problem in buildings.**
9.3.12.AC-MO.3	**Apply construction skills when repairing, restoring or renovating existing buildings.**
9.3.12.AC-MO.4	**Determine work required to repair or renovate an existing building.**
9.3.12.AC-MO.5	**Plan and practice preventative maintenance activities to service existing buildings.**
9.3.12.AC-MO.6	**Maintain and inspect building systems to achieve safe and efficient operation of buildings.**

UNIT OUTLINE FOR:

Design & Technology I

5 Credits
GRADES: 9-12
Prerequisite: None

Course Introduction

In Design & Tech I, students use the Engineering Design Process to plan, build, and test prototypes for a variety of fun, hands-on and engaging design challenges. This class is equal parts designing and building, which means that students spend just as much time planning, sketching, and designing by hand and on the computer as they do in the lab building their designs and prototypes. Students learn how to use tools and machines safely and must pass a safety quiz on each machine before they are permitted to use it. Projects start out simple and somewhat cookie-cutter in the beginning of the year, but progressively get more open ended, which really tests student's creativity and problem thinking skills.

Course Content

1. Intro Design Challenge: A quick 2-3 open-ended design challenge where students team up with a partner and work together to solve a mini design challenge.

2. **Introduction to Digital Design and 3D Printing**: This unit introduces students to the rapidly evolving world of digital design, 3D printing, and introduces students to the Engineering Design Process. Students explore how 3D printers work while developing computer-aided design (CAD) skills using software such as Tinkercad, Onshape, and/or Fusion. Through a series of hands-on design challenges, students learn the software's workflow, tools, and commands as they apply the engineering design process to create, test, and refine original 3D models.

3. **Measurement and Layout**: This short unit introduces students to the standard ruler, how to measure accurately to 1/16", and precisely transfer those dimensions to their projects during the manufacturing process.

4. **Machine, Tool and Lab Safety + Hands-On Build Projects**: This unit is designed to build students' technology and engineering literacy through a series of hands-on activities focused on laboratory, tool, and machine safety. Students learn and apply safe work practices while using the Engineering Design Process to complete engaging activities that reinforce problem-solving, critical thinking, and foundational math, science, and communication skills.

5. **The Design Process - Hands-On Challenge**: Students have previously been introduced to the Engineering Design Process, but this unit is intended to break that process down into each individual step, giving students focused practice identifying a need, brainstorming and evaluating possible solutions, building and testing a prototype, and refining their designs based on information gathered once the designs are built and tested. This experience helps prepare students to more effectively apply the Engineering Design Process during the BHPRSD Tech Challenge.

6. **BHPRSD Tech Challenge**: The BHPRSD Tech Challenge is designed to guide students through the Engineering Design Process as they work in teams to solve an open-ended design challenge. Students begin by defining a problem, then collaborate to research, brainstorm, develop, test, and refine the most effective design solution. The unit culminates in a district-wide competition in which Design & Technology students from Highland, Triton, and Timber Creek compete to determine which team developed the most successful solution.

7. **Advanced Digital Design and 3D Printing**: This unit provides students with the opportunity to continue building their knowledge of digital design, 3D printing, and the Engineering Design Process. Students will explore advanced tools and functions within digital design software, including TinkerCAD, Onshape, and Fusion, with a focus on creating multi-part assemblies and generating technical drawings to document their designs. Through a series of hands-on design challenges, students will develop proficiency with software workflows, tools, and commands while applying the Engineering Design Process to create, test, evaluate, and refine original 3D models.

8. **Egg Drop + Egg Crash/Maglev Car Design Challenge**: This unit allows students to apply the skills and knowledge they have developed throughout the course to solve a series of design challenges focused on protecting a chicken egg from impact. Working in small teams, students will use a variety of inexpensive, lightweight materials such as paper, cardboard, and foam to design and build solutions that meet the challenge requirements. Students will apply the Engineering Design Process to brainstorm, prototype, test, and refine their designs. They will also have the opportunity to incorporate custom 3D-printed components to enhance their solutions and demonstrate their understanding of digital design and manufacturing.

9. **Civil and Structural Engineering + Intro to AutoCAD**: In this unit, students will use principles of mathematics and science to explore the technological systems involved in designing and constructing structures. Students will begin by researching mechanical forces, structural loads, material properties, and geometric shapes that influence structural performance. They will then apply their knowledge by experimenting with and testing bridge designs using computer-based simulations. After identifying an effective bridge design, students will recreate their structure using digital design software before fabricating and assembling a physical model. The unit will culminate with students testing their completed bridges and evaluating the effectiveness of their designs based on performance data.

10. **Rocketry and Aeronautics**: For the final unit of the year, students will participate in a hands-on and engaging design challenge focused on rocket design and flight. Students will continue to apply the Engineering Design Process as they research the principles of flight and use their knowledge to design and create an aerodynamic rocket using digital design software such as Fusion. Students will then fabricate, test, and analyze their rocket designs, using flight data to make modifications and improvements. The unit will culminate with students competing to achieve the greatest flight altitude while demonstrating their understanding of aerodynamics, engineering design, and iterative improvement.

Course Expectations and Skills:

1. Keep and maintain an Engineering notebook, binder, or folder.
2. Apply and document the Engineering process while solving challenges.
3. Practice proper attitude and safe discipline.
4. Develop an acceptable degree of craftsmanship in each activity.
5. Participate and contribute equally to group generated solutions.
6. Apply and analyze science and math related concepts to the challenge.
7. Think creatively while solving real-world problems.
8. Learn from mistakes and view failures as opportunities to improve.
9. Base design decisions on evidence, testing, and data.
10. Balance creativity with functionality, safety, and efficiency.
11. Consider ethical, environmental, and economic impacts when developing solutions.
12. Prepare students to be successful in high school and higher level technology courses.

Resources:
"Technology Education: Learning by Design" by Michael Hacker & David Burghardt, 2008.

Black Horse Pike Regional School District Curriculum

ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21ST CENTURY GLOBAL SKILLS

Unit Title:	Introduction to Digital Design and 3D Printing
Course:	Design & Technology I
Grade Levels:	9-12
Last Revision:	Summer 2026

Unit Overview
This unit introduces students to the rapidly evolving world of digital design, 3D printing, and introduces students to the Engineering Design Process. Students explore how 3D printers work while developing computer-aided design (CAD) skills using software such as Tinkercad, Onshape, and/or Fusion. Through a series of hands-on design challenges, students learn the software's workflow, tools, and commands as they apply the engineering design process to create, test, and refine original 3D models.

Essential Questions	**Enduring Understandings**
How is 3D Printing changing the way products are designed and manufactured?	3D printing has revolutionized the manufacturing process. Typically, facilities are built to manufacture specific parts, but with 3D printing, it offers one facility to manufacture various parts, often much quicker, and designs can be sent to and printed all across the globe.
How are 3D parts designed using a Digital Design software, like TinkerCAD, Onshape, or Fusion?	The goal is to “move well to make well.” Designs start as sketches, which are then extruded, and then modified (fillet, chamfer, etc.) and, depending on the complexity of the shape, this process could be repeated again and again.
How does a digital design become a physical object?	Once a design is made, it is then exported to a slicing software, which can then be sent to a 3D printer to be printed as a physical object.
How does the Engineering Design Process help us design, make and build products to solve problems?	The Engineering Design Process helps us design, make, and build products by providing a structured approach to solving problems. Engineers use this process to identify a need, research information, define requirements and constraints, brainstorm possible solutions, create and test prototypes, evaluate results, and improve designs.
How can testing and iteration improve a design?	In typical manufacturing, a product is planned, tested and prototyped, which takes time, money and effort. With Digital Design, 3D prints can be produced quicker, iterated on faster, and reprinted to meet criteria, constraints and desired specifications.
How do time and form behave differently in a digital design software?	Digital design software changes the relationship between time and form by allowing designers to create, modify, and improve the form of an object quickly and accurately. Instead of rebuilding a physical model each time a change is needed, designers can instantly revise digital models, making the engineering design process faster, more efficient, and more iterative.

Learning Targets/Goals/Outcomes	Standards (NJSLS)
Analyze and compare the difference between rapid prototyping compared to traditional manufacturing.	8.2.8.ITH.2 8.2.12.ED.3
Use tools within a digital design software, like sketch, extrude, fillet, and chamfer to create design solutions to real-world problems.	8.2.12.ED.2
Create a functional 3D printed part by first modeling the part, then exporting to a slicing software.	8.2.12.ED.1
Apply the Engineering Design Process to refine and iterate a design to better solve the real-world design challenge.	8.2.8.ED.2 8.2.12.ED.1 8.2.12.ED.4 8.2.12.ED.5
In digital design software, time and form are not linear. When problems arise, develop a plan to find a solution and experiment with tools and help features within the program, using appropriate vocabulary while doing so.	8.1.2.CS.3 8.1.2.AP.4

Interdisciplinary Connections
English (RST.9-10.2 / RST.11-12.2), Math (HSG-MG.A.1), Science (HS-ETS1-2, HS-ETS1-3), History (6.3.12.CivicsPI.1), Career Readiness, Life Literacies & Key Skills (9.4.12.CI.1)

21st Century Skills
In this unit, students develop critical thinking skills, creativity, collaboration, communication, and problem-solving. Using the Engineering Design Process, students learn to analyze challenges, develop innovative solutions, create prototypes, and refine designs based on testing and feedback. Students build digital literacy, adaptability, and technical communication skills by using CAD software, operating emerging technologies, and presenting their design decisions.

Writing Assignments
• Sketching Assignments • Reflection Assignments • Individual and/or group Presentations

Vocabulary - List Tier 2 (Academic Essentials)	Vocabulary - Tier 3 (Content-Specific)
• Criteria • Constraint • Design • Create • Improve/Iterate • Prototype	• Form • Function • Sketch • Plane • Origin • Pan, Orbit, and Revolve • Extrude • Feature • Face • Fillet and Chamfer • Shell • Additive and Subtractive Manufacturing

Activities, Instructional Strategies, and Assignments
• "I Do, You Do, We Do" - Teacher guided instruction on a new skill, followed by students experimenting with the new skill(s) taught, and summed up as a whole class where students practice the skill again • "Go Slow to Go Fast" - early on in the unit, basic skills are taught, re-taught, and practiced often • Project based and self-exploration activities • Real life digital design challenges, assessments, and projects • Teacher guided instruction • Multiple Visual Examples • Question and Answer • Whole class reviews, check-ins, and student-led presentations • Independent, self-paced learning • Collaborative group (partner) design challenges • Do-nows • Exit Tickets

Accommodations and Modifications (BHPRSD Accommodations and Modifications)
• Provide a variety of concrete examples from familiar contexts • Build background knowledge of content and vocabulary from familiar contexts prior to readings • Use mental models to build understanding through familiar contexts • Provide oral & written instructions • Incorporate multimedia/audio visual representation (YouTube, Discovery Education, TV Show parodies, etc.) to build understanding • Use graphic organizers to guide notes, brainstorming, pre-writing, project planning, and test preparation • Model through processes during assignments and elicit student-generated thoughts to determine gaps in understanding • Highlight, bold, or underline main ideas in readings and in directions for writing assignments in the curricular areas • Provide guiding questions to complete during the activity • Provide chunking of instructional notes and activities to allow for formative assessment (checks for understanding) before moving on to the next stage • Choose cooperative learning groups to ensure effective work, productivity and support socialization

- Use multiple intelligences or the student's learning style to facilitate effective learning when a student is having difficulty grasping concepts
- Provide demonstrations, utilize pictures, or graphic to assist visual learners to support written text information
- Include oral discussions, oral presentations, group collaboration, or other oral delivery methods to support auditory learners
- Provide chunking of assignments into manageable steps, including checklists that clarify directions for assignments
- Provide a clear, concise version of a scoring rubric prior to the assignment or assessment
- Highlight distinctive features/key concepts
- Provide choice of projects depending on the student's interests or strengths.
- Review, repeat, and clarify directions
- Chunk sections of assessment
- Allow for partial credit, when appropriate

Formative Assessments

Students are expected to keep an organized Engineering Design Notebook, folder, or binder. Designs and projects that are done on the computer will be submitted to Google Classroom and are still considered to be part of the student's Engineering Design Notebook.

1. What is 3D Printing? - Google Classroom Writing Assignment
2. Creating simple sketches and extrusions - Submit Screenshots to Google Classroom
3. Editing previously made sketches and extrusions - Submit Screenshots to Google Classroom
4. Modifying sketches and extrusions with tools like fillet and chamfer - Submit Screenshots to Google Classroom
5. Creating basic shapes, *like cubes and cups* - Submit Screenshots to Google Classroom
6. Creating more complex shapes, *like coffee cups with a shelled interior and a rounded handle* - Submit Screenshots to Google Classroom
7. Documenting and Sharing Designs - Individual and/or group presentation on design decisions

Do-now's and checkpoint quizzes will be given during and at the conclusion of these topics

Daily Digital Design skill exercises (sketching, dimensioning, constraints, extrude, fillet, assemblies)
Daily Design sketches and brainstorming activities
Vocabulary checks and quizzes on 3D printing terminology and on Digital Design tools
Exit tickets reflecting on challenges and solutions

Summative Assessments

End of Unit checks on Design Journals, documenting:

- Problem statement
- Criteria and constraints
- Design process
- Digital Design Development
- Testing, Modification, and Improvements made

Final prototype evaluations, reviews, and feedback sessions
Final presentation or design review (partners/small group)
Written reflection explaining design decisions (individual)

Black Horse Pike Regional School District Curriculum

ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21ST CENTURY GLOBAL SKILLS

Unit Title:	Measurement and Layout
Course:	Design & Technology I
Grade Levels:	9-12
Last Revision:	Summer 2026

Unit Overview
This short unit introduces students to the standard ruler, how to measure accurately to 1/16”, and precisely transfer those dimensions to their projects during the manufacturing process.

Essential Questions
Why do we use imperial inches and not the metric system? What are the advantages and disadvantages of each?
Why is it important to know how to both accurately and precisely measure and mark a part and how could the wrong dimension impact the manufacturing process?

Enduring Understandings
The imperial system is most common in the United States, however, metric is still used by Engineers all across the world. Since it is based on 10, calculations and conversions are made easier. Engineers and manufacturers often need to work with both systems depending on the industry, location, equipment, and design requirements.
Accurate and precise measurement is essential to creating functional, safe, and reliable products. Small measurement errors can have significant impacts on the manufacturing process. Incorrect dimensions can lead to wasted materials, failed prototypes, poor product performance, increased costs, and the need for redesign or rework.

Learning Targets/Goals/Outcomes
Use the standard ruler to accurately measure, mark, and layout measurements on a part, in preparation for manufacturing.

Standards (NJSLS)
8.2.12.ED.2 CTE - 9.3.12.AC.1 CTE - 9.3.12.AC.6

Interdisciplinary Connections
Math (HSG-MG.A.3), Science (HS-ETS1-3)

21st Century Skills
In this unit, students continue to develop critical thinking skills, creativity, collaboration, communication, and problem-solving. Even with a skill as basic as measurement, students are still using the Engineering Design Process to analyze challenges, develop innovative solutions, create prototypes, and refine designs based on testing and feedback, as students learn first hand to measure twice, cut once.

Writing Assignments
● Sketching Assignments ● Measurement Practice

Vocabulary - List Tier 2 (Academic Essentials)	Vocabulary - Tier 3 (Content-Specific)
● Ruler ● Inch ● Graduation	● Feature ● Face ● Technical Drawing ● Orthographic (Front, Top, Side, etc.) ● Tolerance ● Center Line

Activities, Instructional Strategies, and Assignments
● “I Do, You Do, We Do” - Teacher guided instruction on a new skill, followed by students experimenting with the new skill(s) taught, and summed up as a whole class where students practice the skill again ● Real life digital design challenges, assessments, and projects ● Teacher guided instruction ● Lectures ● Multiple Visual Examples ● Video Tutorials posted to Google Classroom ● Question and Answer ● Whole class reviews, check-ins, and student-led presentations ● Independent, self-paced learning ● Do-nows ● Exit Tickets

Accommodations and Modifications (BHPRSD Accommodations and Modifications)
● Provide a variety of concrete examples from familiar contexts ● Build background knowledge of content and vocabulary from familiar contexts prior to readings ● Use mental models to build understanding through familiar contexts ● Provide oral & written instructions ● Incorporate multimedia/audio visual representation (YouTube, Discovery Education, TV Show parodies, etc.) to build understanding ● Provide guiding questions to complete during the activity ● Provide chunking of instructional notes and activities to allow for formative assessment (checks for understanding) before moving on to the next stage ● Choose cooperative learning groups to ensure effective work, maximize productivity and support socialization ● Provide chunking of assignments into manageable steps, including checklists that clarify directions for assignments ● Provide a clear, concise version of a scoring rubric prior to the assignment or assessment ● Provide choice of projects depending on the student’s interests or strengths ● Review, repeat, and clarify directions

Formative Assessments

Students are expected to keep an organized Engineering Design Notebook, folder, or binder.
 	
1. Measurement Pre-Assessment
2. Hands-On Measurement Activity
3. Measurement Packet
    a. Measuring to 1/16”
    b. Measuring to ¼” and ⅛”
    c. Adding and Subtracting Fractions (1/16” to Whole Inch)
 	
Do-now’s and checkpoint quizzes will be given during and at the conclusion of these topics

Summative Assessments

● Final Ruler Reading Assessment
    ○ Written Section
    ○ Hands-On Section
● In the next Unit, students will be learning machine safety and will continue to use the skills learned in this unit to measure and mark out their workpieces as they progress through the manufacturing process

Black Horse Pike Regional School District Curriculum

ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21ST CENTURY GLOBAL SKILLS

Unit Title:	Machine, Tool and Lab Safety + Hands-On Build Projects
Course:	[Design & Technology I]()
Grade Levels:	9-12
Last Revision:	Summer 2026

Unit Overview
This course is designed to increase literacy in technology and engineering through a series of hands-on activities that utilize the engineering design process by following general shop, tool and machine safety as well as reinforcing basic math, science, and communication skills. This unit focuses heavily on: ● Class procedures and expectations. ● General shop safety and procedures. ● Specific tool and machine safety rules and procedures.

Essential Questions	**Enduring Understandings**
Why is safety an essential part of working in a technology education laboratory?	Technology labs often involve tools, machines, materials, and processes that can create potential hazards if they are not used properly. Following safety procedures helps students identify risks, make responsible decisions, and prevent injuries
How can understanding how machines work help us operate them safely and effectively?	Equipment shall be used only as intended and within the specifications set forth by the manufacturer. If equipment is used improperly, this creates a dangerous working environment for the user and others nearby.
What role does personal protective equipment (PPE) play in preventing injuries?	Personal protective equipment (PPE) plays a critical role in preventing injuries by reducing exposure to hazards in the technology education laboratory. PPE acts as a protective barrier between students and potential dangers such as flying debris, sharp materials, excessive noise, heat, chemicals, and moving machine parts. While PPE does not replace safe operating procedures, proper use of equipment such as safety glasses, hearing protection, gloves, and protective clothing helps minimize the risk of injury and promotes a safe working environment.
How does machine safety connect to problem-solving and the engineering design process?	Throughout the design process, engineers identify potential hazards, establish safety criteria and constraints, select appropriate tools and procedures, and test solutions to ensure they work safely and effectively.

Learning Targets/Goals/Outcomes	Standards (NJSLS)
Safely use all tools and machines, as outlined in this unit.	8.2.12.ED.1 8.2.2.ITH.4 CTE - 9.3.12.AC.2
Understand the intended use and limitations of each machine and identify which machine is ideal for the task at hand.	8.2.12.ED.1 8.2.12.ED.5 8.2.2.ITH.4 CTE - 9.3.12.AC-CST.9
Apply knowledge of machine and tool safety, their intended use, and consider how parts can be designed more effectively using the Engineering Design Process.	8.2.12.ED.5 8.2.2.ITH.4

Interdisciplinary Connections
Science (ETS1.A), Career Readiness, Life Literacies & Key Skills (9.2.12.CAP.6)

21st Century Skills
In this unit, students continue to develop critical thinking skills, creativity, collaboration, communication, and problem-solving. Using the Engineering Design Process, students learn to use their knowledge of machine and tool safety to better analyze challenges, develop innovative solutions, and create prototypes. Ultimately, the focus of this unit is on safe decision making, workplace behavior, and effective communication.

Writing Assignments
• Sketching Assignments • Reflection Assignments

Vocabulary - List Tier 2 (Academic Essentials)	Vocabulary - Tier 3 (Content-Specific)

• Blade
• Drill
• Table
• Stock/Workpiece
• PPE
	• Drill Press
	    ○ Chuck and Chuck Key
	    ○ RPM's and Feed Rate
	    ○ Table Height Adjustment Knob
	    ○ Vise and clamp
	    ○ Forstner and Twist Bit
	    ○ Thru-hole
	• Band Saw
	    ○ Blade Guard
	    ○ Blade Guard Lock
	    ○ Backing out of a cut
	    ○ Waste-side of a cut
	• Sander
	    ○ Oscillating Belt and Disc
	    ○ Sandpaper Grit

Activities, Instructional Strategies, and Assignments
“Go Slow to Go Fast” - early on in the unit, basic skills are taught, re-taught, and practiced often   - Hands-on Projects   - Reinforces measurement and layout from the previous unit   - Reinforces terms learned in the Digital Design Unit, like face, top, front, and side views, etc.   - Students practice using the machines safely using scrap wood before working on their projects   - Projects are designed to give students experience on the drill press, band saw, and sander   - Whole-class, teacher-guided safety demonstrations   - POV Edpuzzle Safety videos   - Safety quizzes   - Question and Answer   - Whole class reviews and check-ins   - Do-nows   - Exit Tickets

Accommodations and Modifications (BHPRSD Accommodations and Modifications)
- Build background knowledge of content and vocabulary from familiar contexts prior to readings   - Provide oral & written instructions   - Incorporate multimedia/audio visual representation (YouTube, Discovery Education, TV Show parodies, etc.) to build understanding   - Use graphic organizers to guide notes, brainstorming, pre-writing, project planning, and test preparation   - Model through processes during assignments and elicit student-generated thoughts to determine gaps in understanding   - Highlight, bold, or underline main ideas in readings and in directions for writing assignments in the curricular areas   - Provide guiding questions to complete during the activity   - Provide chunking of instructional notes and activities to allow for formative assessment (checks for understanding) before moving on to the next stage   - Choose cooperative learning groups to ensure effective work, maximize productivity and support socialization   - Use multiple intelligences or the student's learning style to facilitate effective learning when a student is having difficulty grasping concepts   - Provide demonstrations, utilize pictures, or graphic to assist visual learners to support written text information   - Provide chunking of assignments into manageable steps, including checklists that clarify directions for assignments   - Provide a clear, concise version of a scoring rubric prior to the assignment or assessment   - Highlight distinctive features/key concepts   - Provide choice of projects depending on the student’s interests or strengths.   - Review, repeat, and clarify directions   - Chunk sections of assessment   - Allow for partial credit, when appropriate

Formative Assessments
Students are expected to keep an organized Engineering Design Notebook, folder, or binder. Prior to getting materials, students practice measurement and layout on paper before repeating that process on their workpiece. All handouts and work done with pencil and paper should be stored in the Engineering Design Notebook. 1. Edpuzzle Safety Videos 2. Measurement and Layout Practice (done on paper prior to receiving material) 3. Measurement and Layout Practice on the actual workpiece 4. Hands-on practice using each machine (with scrap wood) Do-now's and checkpoint quizzes will be given during and at the conclusion of these topics

Summative Assessments
● Final Project Prototype Evaluations, including measurement, layout, safety, and accuracy of machining ● Final Design Journal checks ● Safety Quiz assessments

Unit Title:	The Design Process - Hands-On Challenge
Course:	Design & Technology I
Grade Levels:	9-12
Last Revision:	Summer 2026

Unit Overview
Students have previously been introduced to the Engineering Design Process, but this unit is intended to break that process down into each individual step, giving students focused practice identifying a need, brainstorming and evaluating possible solutions, building and testing a prototype, and refining their designs based on information gathered once the designs are built and tested. This experience helps prepare students to more effectively apply the Engineering Design Process during the BHPRSD Tech Challenge.

Essential Questions	**Enduring Understandings**
What are the steps of the Engineering Design Process and how can this process be applied to solve a technological problem?	The Engineering Design Process can be used to solve a technological problem by following a structured series of steps that lead to an effective solution: 1. Identify the problem – Define the need or challenge and understand the criteria and constraints. 2. Research and gather information – Learn about the problem, existing solutions, and relevant technologies. 3. Brainstorm possible solutions – Generate multiple ideas without judging them initially. 4. Select the best solution – Evaluate ideas based on effectiveness, safety, cost, materials, and feasibility. 5. Develop a design – Create sketches, plans, or models that communicate the chosen solution. 6. Build a prototype – Construct a working model or first version of the design. 7. Test and evaluate – Determine whether the prototype meets the design criteria and identify areas for improvement. 8. Improve and redesign – Modify the design based on test results and feedback, repeating the process as needed.
What are the benefits and concerns involved with working on a team?	Working on a team promotes more diverse ideas, a shared workload, and collaboration, which leads to improved problem-solving. But working on a team can lead to conflict due to issues with communication.

How does the Engineering Design Process help us design, make and build products to solve problems?	The Engineering Design Process helps us design, make, and build products by providing a structured approach to solving problems. Engineers use this process to identify a need, research information, define requirements and constraints, brainstorm possible solutions, create and test prototypes, evaluate results, and improve their designs.
How can testing and iteration improve a design?	In typical manufacturing, a product is planned, tested and prototyped, which takes time, money and effort. With Digital Design, 3D prints can be produced quicker, iterated on faster, and reprinted to meet criteria, constraints and desired specifications.

Learning Targets/Goals/Outcomes	**Standards (NJSLS)**
Define the need or challenge and understand the criteria and constraints, as outlined on the Design Brief.	8.2.12.ED.1 8.2.5.ED.5
Research and gather information to learn about the problem, existing solutions, and relevant technologies.	8.2.12.ED.1 8.2.2.NT.2 8.2.5.ED.2 CTE - 9.3.12.AC-DES.1
Brainstorm and generate multiple ideas using the information gathered while researching the Design Challenge.	8.2.12.ED.1 8.2.2.NT.2 8.2.5.ED.2
Evaluate brainstormed ideas based on their effectiveness, safety, cost, materials, and feasibility, as well as how they relate to the criteria and constraints outlined on the Design Brief.	8.2.12.ED.1 8.2.2.NT.2 8.2.5.ED.2
Create sketches, plans, or models that communicate the chosen solution.	8.2.12.ED.2 8.2.5.ED.2 CTE - 9.3.12.AC.6
Use tools and machines safely and appropriately to construct a working model or first version of the design.	8.2.12.ED.4 8.2.2.ED.3 CTE - 9.3.12.AC-CST.9
Test and evaluate the prototype and make necessary adjustments and modifications to the prototype to better adhere to the criteria and constraints.	8.2.12.ED.5 8.2.12.ED.6 8.2.5.ITH.2 CTE - 9.3.12.AC-CST.3
Recognize that the Design Process is iterative in nature and this process is never truly completed, as designs can always be improved through innovation.	8.2.5.ED.6 8.2.12.ED.1 8.2.12.ED.2 8.2.12.ED.3 8.2.12.ED.4 8.2.12.ED.5 8.2.12.ED.6
Work collaboratively with others, sharing ideas and the workload evenly.	8.2.5.ED.2

Interdisciplinary Connections
English (RST.9-10.2 / RST.11-12.2), Math (HSG-MG.A.1), Science (MS-ETS1-1-4), Career Readiness, Life Literacies & Key Skills (NJSLS-CLKS 9.4)

21st Century Skills
In this unit, students develop critical thinking skills, creativity, collaboration, communication, and problem-solving. Using the Engineering Design Process, students learn to analyze challenges, develop innovative solutions, create prototypes, and refine designs based on testing and feedback.

Writing Assignments
• Sketching Assignments • Design Matrix Assignments • Reflection Assignments • Individual and/or group Presentations

Vocabulary - List Tier 2 (Academic Essentials)	Vocabulary - Tier 3 (Content-Specific)
•	• Design Brief • Criteria • Constraints • Improve/Iterate

Activities, Instructional Strategies, and Assignments
• "Go Slow to Go Fast" - early on in the unit, basic skills are taught, re-taught, and practiced often   ○ Each step of the Design Process will be covered in detail, multiple times, and at a slow pace • Project based and self-exploration activities • Real life digital design challenges, assessments, and projects • Teacher guided instruction • Lectures • Multiple Visual Examples • Question and Answer • Whole class reviews, check-ins, and student-led presentations • Independent, self-paced learning • Collaborative group (partner) design challenges • Do-nows • Exit Tickets

Accommodations and Modifications (BHPRSD Accommodations and Modifications)
• Provide a variety of concrete examples from familiar contexts • Build background knowledge of content and vocabulary from familiar contexts prior to readings • Use mental models to build understanding through familiar contexts • Provide oral & written instructions

- Incorporate multimedia/audio visual representation
- Use graphic organizers to guide notes, brainstorming, pre-writing, project planning, and test preparation
- Model through processes during assignments and elicit student-generated thoughts to determine gaps in understanding
- Highlight, bold, or underline main ideas in readings and in directions for writing assignments in the curricular areas
- Provide guiding questions to complete during the activity
- Provide chunking of instructional notes and activities to allow for formative assessment (checks for understanding) before moving on to the next stage
- Choose cooperative learning groups to ensure effective work, maximize productivity and support socialization
- Use multiple intelligences or the student's learning style to facilitate effective learning when a student is having difficulty grasping concepts
- Provide demonstrations, utilize pictures, or graphic to assist visual learners to support written text information
- Include oral discussions, oral presentations, group collaboration, or other oral delivery methods to support auditory learners
- Provide chunking of assignments into manageable steps, including checklists that clarify directions for assignments
- Provide a clear, concise version of a scoring rubric prior to the assignment or assessment
- Highlight distinctive features/key concepts
- Provide choice of projects depending on the student's interests or strengths.
- Review, repeat, and clarify directions
- Chunk sections of assessment
- Allow for partial credit, when appropriate

Formative Assessments

Students are expected to keep an organized Engineering Design Notebook, folder, or binder. Designs and projects that are done on the computer will be submitted to Google Classroom and are still considered to be part of the student's Engineering Design Notebook.

1. Identifying the Problem
2. Research and Brainstorming
3. Materials Consideration Design Matrix
4. Thumbnail Sketch Design Matrix
5. Final Sketch of Desired Prototype
6. Build checkpoints
7. Testing and Modification Rationale

Do-now's and checkpoint quizzes will be given during and at the conclusion of these topics

Summative Assessments
Final Design Prototype Evaluations End of Unit checks on Design Journals, documenting: ● Problem statement ● Criteria and constraints ● Design process ● Digital Design Development ● Testing, Modification, and Improvements made Final presentation or design review (partners/small group) Written reflection explaining design decisions (individual)

Black Horse Pike Regional School District Curriculum

ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21ST CENTURY GLOBAL SKILLS

Unit Title:	BHPRSD Tech Challenge
Course:	Design & Technology I
Grade Levels:	9-12
Last Revision:	Summer 2026

Unit Overview
The BHPRSD Tech Challenge is designed to guide students through the Engineering Design Process as they work in teams to solve an open-ended design challenge. Students begin by defining a problem, then collaborate to research, brainstorm, develop, test, and refine the most effective design solution. The unit culminates in a district-wide competition in which Design & Technology students from Highland, Triton, and Timber Creek compete to determine which team developed the most successful solution.

Essential Questions	**Enduring Understandings**
What are the steps of the Engineering Design Process and how can this process be applied to solve a technological problem?	The Engineering Design Process can be used to solve a technological problem by following a structured series of steps that lead to an effective solution: 1. Identify the problem – Define the need or challenge and understand the criteria and constraints. 2. Research and gather information – Learn about the problem, existing solutions, and relevant technologies. 3. Brainstorm possible solutions – Generate multiple ideas without judging them initially. 4. Select the best solution – Evaluate ideas based on effectiveness, safety, cost, materials, and feasibility. 5. Develop a design – Create sketches, plans, or models that communicate the chosen solution. 6. Build a prototype – Construct a working model or first version of the design. 7. Test and evaluate – Determine whether the prototype meets the design criteria and identify areas for improvement. 8. Improve and redesign – Modify the design based on test results and feedback, repeating the process as needed.
What are the benefits and concerns involved with working on a team?	Working on a team promotes more diverse ideas, a shared workload, and collaboration, which leads to improved problem-solving. But working on a team can lead to conflict due to issues with communication.

How does the Engineering Design Process help us design, make and build products to solve problems?	The Engineering Design Process helps us design, make, and build products by providing a structured approach to solving problems. Engineers use this process to identify a need, research information, define requirements and constraints, brainstorm possible solutions, create and test prototypes, evaluate results, and improve their designs.
How can testing and iteration improve a design?	In typical manufacturing, a product is planned, tested and prototyped, which takes time, money and effort. With Digital Design, 3D prints can be produced quicker, iterated on faster, and reprinted to meet criteria, constraints and desired specifications.

Learning Targets/Goals/Outcomes	**Standards (NJSLS)**
Define the need or challenge and understand the criteria and constraints, as outlined on the Design Brief.	8.2.12.ED.1 8.2.5.ED.5
Research and gather information to learn about the problem, existing solutions, and relevant technologies.	8.2.12.ED.1 8.2.2.NT.2 8.2.5.ED.2 CTE - 9.3.12.AC-DES.1
Brainstorm and generate multiple ideas using the information gathered while researching the Design Challenge.	8.2.12.ED.1 8.2.2.NT.2 8.2.5.ED.2
Evaluate brainstormed ideas based on their effectiveness, safety, cost, materials, and feasibility, as well as how they relate to the criteria and constraints outlined on the Design Brief.	8.2.12.ED.1 8.2.2.NT.2 8.2.5.ED.2
Create sketches, plans, or models that communicate the chosen solution.	8.2.12.ED.2 8.2.5.ED.2 CTE - 9.3.12.AC.6
Use tools and machines safely and appropriately to construct a working model or first version of the design.	8.2.12.ED.4 8.2.2.ED.3 CTE - 9.3.12.AC-CST.9
Test and evaluate the prototype and make necessary adjustments and modifications to the prototype to better adhere to the criteria and constraints.	8.2.12.ED.5 8.2.12.ED.6 8.2.5.ITH.2 CTE - 9.3.12.AC-CST.3
Recognize that the Design Process is iterative in nature and this process is never truly completed, as designs can always be improved through innovation.	8.2.5.ED.6 8.2.12.ED.1 8.2.12.ED.2 8.2.12.ED.3 8.2.12.ED.4 8.2.12.ED.5 8.2.12.ED.6
Work collaboratively with others, sharing ideas and the workload evenly.	8.2.5.ED.2

Interdisciplinary Connections
English (RST.9-10.2 / RST.11-12.2), Math (HSG-MG.A.1), Science (MS-ETS1-1-4), Career Readiness, Life Literacies & Key Skills (NJSLS-CLKS 9.4)

21st Century Skills
In this unit, students continue to develop critical thinking skills, creativity, collaboration, communication, and problem-solving. Using the Engineering Design Process, students learn to analyze challenges, develop innovative solutions, create prototypes, and refine designs based on testing and feedback.

Writing Assignments
● Sketching Assignments ● Design Matrix Assignments ● Reflection Assignments ● Individual and/or group Presentations

Activities, Instructional Strategies, and Assignments
● Project based and self-exploration activities ● Real life digital design challenges, assessments, and projects ● Teacher guided instruction ● Lectures ● Multiple Visual Examples ● Question and Answer ● Whole class reviews, check-ins, and student-led presentations ● Collaborative group (partner) design challenges ● Do-nows ● Exit Tickets

Accommodations and Modifications (BHPRSD Accommodations and Modifications)
● Provide a variety of concrete examples from familiar contexts ● Build background knowledge of content and vocabulary from familiar contexts prior to readings ● Use mental models to build understanding through familiar contexts ● Provide oral & written instructions ● Incorporate multimedia/audio visual representation (YouTube, Discovery Education, TV Show parodies, etc.) to build understanding ● Use graphic organizers to guide notes, brainstorming, pre-writing, project planning, and test preparation ● Model through processes during assignments and elicit student-generated thoughts to determine gaps in understanding ● Highlight, bold, or underline main ideas in readings and in directions for writing assignments in the curricular areas ● Provide guiding questions to complete during the activity ● Provide chunking of instructional notes and activities to allow for formative assessment (checks for

understanding) before moving on to the next stage
- Choose cooperative learning groups to ensure effective work, maximize productivity and support socialization
- Use multiple intelligences or the student's learning style to facilitate effective learning when a student is having difficulty grasping concepts
- Provide demonstrations, utilize pictures, or graphic to assist visual learners to support written text information
- Include oral discussions, oral presentations, group collaboration, or other oral delivery methods to support auditory learners
- Provide chunking of assignments into manageable steps, including checklists that clarify directions for assignments
- Provide a clear, concise version of a scoring rubric prior to the assignment or assessment
- Highlight distinctive features/key concepts
- Provide choice of projects depending on the student's interests or strengths.
- Review, repeat, and clarify directions
- Chunk sections of assessment
- Allow for partial credit, when appropriate

Formative Assessments

Students are expected to keep an organized Engineering Design Notebook, folder, or binder. Designs and projects that are done on the computer will be submitted to Google Classroom and are still considered to be part of the student's Engineering Design Notebook.

1. Daily Activity Log
2. Identifying the Problem
3. Research and Brainstorming
4. Materials Consideration Design Matrix
5. Thumbnail Sketch Design Matrix
6. Final Sketch of Desired Prototype
7. Build checkpoints
8. Team Name and Logo Sketches
9. Final Team Name and Logo
10. Testing and Modification Rationale

Do-now's and checkpoint quizzes will be given during and at the conclusion of these topics

Summative Assessments

Final Design Prototype Evaluations
End of Unit checks on Design Journals, documenting:

- Problem statement
- Criteria and constraints
- Design process
- Digital Design Development
- Testing, Modification, and Improvements made

Final presentation or design review (partners/small group)
Written reflection explaining design decisions (individual)

Black Horse Pike Regional School District Curriculum

ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21ST CENTURY GLOBAL SKILLS

Unit Title:	Advanced Digital Design and 3D Printing
Course:	Design & Technology I
Grade Levels:	9-12
Last Revision:	Summer 2026

Unit Overview
This unit provides students with the opportunity to continue building their knowledge of digital design, 3D printing, and the Engineering Design Process. Students will explore advanced tools and functions within digital design software, including TinkerCAD, Onshape, and Fusion, with a focus on creating multi-part assemblies and generating technical drawings to document their designs. Through a series of hands-on design challenges, students will develop proficiency with software workflows, tools, and commands while applying the Engineering Design Process to create, test, evaluate, and refine original 3D models.

Essential Questions	**Enduring Understandings**
How are 3D parts designed using a Digital Design software, like TinkerCAD, Onshape, or Fusion?	The goal is to “move well to make well.” Designs start as sketches, which are then extruded, and then modified (fillet, chamfer, etc.) and, depending on the complexity of the shape, this process could be repeated again and again.
With regards to editing existing parts, what are some of the benefits of using digital design as opposed to traditional manufacturing?	Unlike traditional manufacturing, digital design allows users to literally go back in time and edit features and geometries previously made. Once those edits are made, the part can be reprinted, tested, and iterated on. With traditional manufacturing, parts cannot be as easily edited once they are made and typically need to be remade from scratch, which takes more time and costs more money and effort.
What is the significance of standardization and proper dimensioning with regards to creating parts and Engineering Drawings?	Standardization and proper dimensioning are essential when creating parts and engineering drawings because they ensure accuracy, consistency, and clear communication between designers, engineers, and manufacturers. By following industry standards, designers can create parts that are compatible, repeatable, and able to be produced correctly regardless of who manufactures them.
When using a digital design software, how do designers choose which tool is most effective/best for that part?	The great thing about digital design is that there are many ways to create a part or geometry and there’s not one “right” answer. Some tools allow designers to make the part quicker, with greater accuracy, or, allow for easier edits and future changes to the part.
How does the Engineering Design Process help us design, make and build products to solve problems?	The Engineering Design Process helps us design, make, and build products by providing a structured approach to solving problems. Engineers use this process to identify a need, research information, define requirements and constraints, brainstorm possible solutions, create and test prototypes and evaluate and improve their designs.

How can testing and iteration improve a design?	In typical manufacturing, a product is planned, tested and prototyped, which takes time, money and effort. With Digital Design, 3D prints can be produced quicker, iterated on faster, and reprinted to meet criteria, constraints and desired specifications.

Learning Targets/Goals/Outcomes	**Standards (NJSLS)**
Use tools within a digital design software, like shell and hole to create more advanced design solutions to real-world problems.	8.2.12.ED.2
Use assembly tools within a digital design software, like mate features in Onshape to create advanced, multi-part assemblies.	8.2.12.ED.2
Use drawing and dimensioning tools within a digital design software, like the DWG and dimensioning tools in Onshape to create industry-standard, fully dimensioned drawings.	8.2.12.ED.2 CTE - 9.3.12.AC.6
Create a functional 3D printed part by first modeling the part, then exporting to a slicing software.	8.2.12.ED.1
Apply the Engineering Design Process to refine and iterate a design to better solve the real-world design challenge.	8.2.8.ED.2 8.2.12.ED.1 8.2.12.ED.4 8.2.12.ED.5 8.2.5.ITH.2
In digital design software, time and form are not linear. When problems arise, develop a plan to find a solution and experiment with tools and help features within the program, using appropriate vocabulary while doing so.	8.1.2.CS.3 8.1.2.AP.4

Interdisciplinary Connections
English (RST.9-10.2 / RST.11-12.2), Math (HSG-MG.A.1), Science (HS-ETS1-2, HS-ETS1-3), History (6.3.12.CivicsPI.1), Career Readiness, Life Literacies & Key Skills (9.4.12.CI.1)

21st Century Skills
In this unit, students continue to develop critical thinking skills, creativity, collaboration, communication, and problem-solving. Using the Engineering Design Process, students learn to analyze challenges, develop innovative solutions, create prototypes, and refine designs based on testing and feedback. Students build digital literacy, adaptability, and technical communication skills by using CAD software, operating emerging technologies, and presenting their design decisions.

Writing Assignments
• Sketching Assignments • Reflection Assignments • Individual and/or group Presentations

Vocabulary - List Tier 2 (Academic Essentials)	Vocabulary - Tier 3 (Content-Specific)
• Criteria • Constraint • Design • Create • Improve/Iterate • Prototype	• Sketch • Plane • Origin • Pan, Orbit, and Revolve • Extrude • Feature • Face • Fillet and Chamfer • Shell • Additive and Subtractive Manufacturing • Hole • Assemblies • Mate Features • Drawings (DWG's) • Dimension line • Section Views • Annotations

Activities, Instructional Strategies, and Assignments
• "I Do, You Do, We Do" - Teacher guided instruction on a new skill, followed by students experimenting with the new skill(s) taught, and summed up as a whole class where students practice the skill again • "Go Slow to Go Fast" - early on in the unit, basic skills are taught, re-taught, and practiced often • Project based and self-exploration activities • Real life digital design challenges, assessments, and projects • Teacher guided instruction • Lectures • Multiple Visual Examples • Question and Answer • Whole class reviews, check-ins, and student-led presentations • Independent, self-paced learning • Collaborative group (partner) design challenges • Do-nows • Exit Tickets

Accommodations and Modifications (BHPRSD Accommodations and Modifications)
• Provide a variety of concrete examples from familiar contexts • Build background knowledge of content and vocabulary from familiar contexts prior to readings • Use mental models to build understanding through familiar contexts • Provide oral & written instructions • Incorporate multimedia/audio visual representation (YouTube, Discovery Education, TV Show parodies, etc.) to build understanding • Use graphic organizers to guide notes, brainstorming, pre-writing, project planning, and test preparation • Model through processes during assignments and elicit student-generated thoughts to determine gaps in understanding

- Highlight, bold, or underline main ideas in readings and in directions for writing assignments in the curricular areas
- Provide guiding questions to complete during the activity
- Provide chunking of instructional notes and activities to allow for formative assessment (checks for understanding) before moving on to the next stage
- Choose cooperative learning groups to ensure effective work, maximize productivity and support socialization
- Use multiple intelligences or the student's learning style to facilitate effective learning when a student is having difficulty grasping concepts
- Provide demonstrations, utilize pictures, or graphic to assist visual learners to support written text information
- Include oral discussions, oral presentations, group collaboration, or other oral delivery methods to support auditory learners
- Provide chunking of assignments into manageable steps, including checklists that clarify directions for assignments
- Provide a clear, concise version of a scoring rubric prior to the assignment or assessment
- Highlight distinctive features/key concepts
- Provide choice of projects depending on the student's interests or strengths.
- Review, repeat, and clarify directions
- Chunk sections of assessment
- Allow for partial credit, when appropriate

Formative Assessments

Students are expected to keep an organized Engineering Design Notebook, folder, or binder. Designs and projects that are done on the computer will be submitted to Google Classroom and are still considered to be part of the student's Engineering Design Notebook.

1. Creating multi-part assemblies - Submit links to project(s) to Google Classroom
2. Editing previously made multi-part assemblies - Submit links to project(s) to Google Classroom
3. Documenting Designs through DWG's - Submit links and exported PDF's of project(s) to Google Classroom
4. Reading Dimensions from Blueprints - handout
5. Creating advanced geometries, *like the Do Nothing Machine* - Submit links to project(s) to Google Classroom

Do-now's and checkpoint quizzes will be given during and at the conclusion of these topics

Digital Design skill exercises (sketching, dimensioning, constraints, assemblies, and DWG's)
Design sketches and brainstorming activities
Vocabulary checks and quizzes on 3D printing terminology and on Digital Design tools
Exit tickets reflecting on challenges and solutions
Peer design critiques

Summative Assessments
Final Design Prototype Evaluations End of Unit checks on Design Journals, documenting: ● Problem statement ● Criteria and constraints ● Design process ● Digital Design Development ● Testing, Modification, and Improvements made Final presentation or design review (partners/small group) Written reflection explaining design decisions (individual)

Black Horse Pike Regional School District Curriculum

ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21ST CENTURY GLOBAL SKILLS

Unit Title:	Egg Drop + Egg Crash/Maglev Car Design Challenge
Course:	Design & Technology I
Grade Levels:	9-12
Last Revision:	Summer 2026

Unit Overview
This unit allows students to apply the skills and knowledge they have developed throughout the course to solve a series of design challenges focused on protecting a chicken egg from impact. Working in small teams, students will use a variety of inexpensive, lightweight materials such as paper, cardboard, and foam to design and build solutions that meet the challenge requirements. Students will apply the Engineering Design Process to brainstorm, prototype, test, and refine their designs. They will also have the opportunity to incorporate custom 3D-printed components to enhance their solutions and demonstrate their understanding of digital design and manufacturing.

Essential Questions	**Enduring Understandings**
What are the steps of the Engineering Design Process and how can this process be applied to solve a technological problem?	The Engineering Design Process can be used to solve a technological problem by following a structured series of steps that lead to an effective solution: 1. Identify the problem – Define the need or challenge and understand the criteria and constraints. 2. Research and gather information – Learn about the problem, existing solutions, and relevant technologies. 3. Brainstorm possible solutions – Generate multiple ideas without judging them initially. 4. Select the best solution – Evaluate ideas based on effectiveness, safety, cost, materials, and feasibility. 5. Develop a design – Create sketches, plans, or models that communicate the chosen solution. 6. Build a prototype – Construct a working model or first version of the design. 7. Test and evaluate – Determine whether the prototype meets the design criteria and identify areas for improvement. 8. Improve and redesign – Modify the design based on test results and feedback, repeating the process as needed.
What are the benefits and concerns involved with working on a team?	Working on a team promotes more diverse ideas, a shared workload, and collaboration, which leads to improved problem-solving. But working on a team can lead to conflict due to issues with communication.

For this challenge, students are given cheap and inexpensive materials, like paper, cardboard and foam. How can we study and what can we learn from other real-world designs to help in this challenge?	Students can study real-world designs, like parachutes, air bags, crumple zones on modern day cars, study crash-test physics, and other engineering solutions to understand how designers use limited resources, materials, and creative problem-solving to overcome challenges. By analyzing existing products and structures, students can identify design strategies that can be applied to their own egg protection challenge.
What is the importance of many technological systems working together as a whole?	The success of the design depends on how multiple systems interact to safely absorb and distribute the forces of a collision, as no single part of the vehicle can protect the egg on its own.
How does the Engineering Design Process help us design, make and build products to solve problems?	The Engineering Design Process helps us design, make, and build products by providing a structured approach to solving problems. Engineers use this process to identify a need, research information, define requirements and constraints, brainstorm possible solutions, create and test prototypes, evaluate results, and improve their designs.
How can testing and iteration improve a design?	In typical manufacturing, a product is planned, tested and prototyped, which takes time, money and effort. With Digital Design, 3D prints can be produced quicker, iterated on faster, and reprinted to meet criteria, constraints and desired specifications.

Learning Targets/Goals/Outcomes	**Standards (NJSLS)**
Define the need or challenge and understand the criteria and constraints, as outlined on the Design Brief.	8.2.12.ED.1 8.2.5.ED.5
Research and gather information to learn about the problem, existing solutions, and relevant technologies.	8.2.12.ED.1 8.2.2.NT.2 8.2.5.ED.2 CTE - 9.3.12.AC-DES.1
Brainstorm and generate multiple ideas using the information gathered while researching the Design Challenge.	8.2.12.ED.1 8.2.2.NT.2
Evaluate brainstormed ideas based on their effectiveness, safety, cost, materials, and feasibility, as well as how they relate to the criteria and constraints outlined on the Design Brief.	8.2.12.ED.1 8.2.2.NT.2 8.2.5.ED.2
Create sketches, plans, or models that communicate the chosen solution.	8.2.12.ED.2 8.2.5.ED.2 CTE - 9.3.12.AC.6
Use tools and machines safely and appropriately to construct a working model or first version of the design.	8.2.12.ED.4 8.2.2.ED.3
Test and evaluate the prototype and make necessary adjustments and modifications to the prototype to better adhere to the criteria and constraints.	8.2.12.ED.5 8.2.12.ED.6 8.2.5.ITH.2

Recognize that the Design Process is iterative in nature and this process is never truly completed, as designs can always be improved through innovation.	8.2.8.ED.2 8.2.12.ED.1 8.2.12.ED.2 8.2.12.ED.3 8.2.12.ED.4 8.2.12.ED.5 8.2.12.ED.6
Consider the effectiveness of each part individually, but also the effectiveness those parts have on the greater whole of the Egg Crash Car. Redesign and modify the design as needed.	8.2.8.NT.3 CTE - 9.3.12.AC-CST.3
Work collaboratively with others, sharing ideas and the workload evenly.	8.2.5.ED.2

Interdisciplinary Connections
English (RST.9-10.2 / RST.11-12.2), Math (NJSLS-M G-MG), Science (HS-PS2-1-2), Career Readiness, Life Literacies & Key Skills (NJSLS-CLKS 9.4)

21st Century Skills
In this unit, students continue to develop critical thinking skills, creativity, collaboration, communication, and problem-solving. Using the Engineering Design Process, students learn to analyze challenges, develop innovative solutions, create prototypes, and refine designs based on testing and feedback.

Writing Assignments
● Sketching Assignments ● Design Matrix Assignments ● Reflection Assignments ● Individual and/or group Presentations

Vocabulary - List Tier 2 (Academic Essentials)	**Vocabulary - Tier 3 (Content-Specific)**
● Newton’s Laws of Motion ● Physics ● Potential Energy ● Kinetic Energy ● Elasticity ● Force ● Friction ● Acceleration and deceleration ● Inertia ● Impulse ● Impact ● Dissipation ● Rigidity	● Chassis ● Frame ● Suspension ● Axle ● Crumple Zone ● Crashworthiness

Activities, Instructional Strategies, and Assignments
- Project based and self-exploration activities   - Real life digital design challenges, assessments, and projects   - Teacher guided instruction   - Lectures   - Multiple Visual Examples   - Question and Answer   - Whole class reviews, check-ins, and student-led presentations   - Independent, self-paced learning   - Collaborative group (partner) design challenges   - Do-nows   - Exit Tickets

Accommodations and Modifications (BHPRSD Accommodations and Modifications)
- Provide a variety of concrete examples from familiar contexts   - Build background knowledge of content and vocabulary from familiar contexts prior to readings   - Use mental models to build understanding through familiar contexts   - Provide oral & written instructions   - Incorporate multimedia/audio visual representation (YouTube, Discovery Education, TV Show parodies, etc.) to build understanding   - Use graphic organizers to guide notes, brainstorming, pre-writing, project planning, and test preparation   - Model through processes during assignments and elicit student-generated thoughts to determine gaps in understanding   - Highlight, bold, or underline main ideas in readings and in directions for writing assignments in the curricular areas   - Provide guiding questions to complete during the activity   - Provide chunking of instructional notes and activities to allow for formative assessment (checks for understanding) before moving on to the next stage   - Choose cooperative learning groups to ensure effective work, maximize productivity and support socialization   - Use multiple intelligences or the student's learning style to facilitate effective learning when a student is having difficulty grasping concepts   - Provide demonstrations, utilize pictures, or graphic to assist visual learners to support written text information   - Include oral discussions, oral presentations, group collaboration, or other oral delivery methods to support auditory learners   - Provide chunking of assignments into manageable steps, including checklists that clarify directions for assignments   - Provide a clear, concise version of a scoring rubric prior to the assignment or assessment   - Highlight distinctive features/key concepts   - Provide choice of projects depending on the student’s interests or strengths.   - Review, repeat, and clarify directions   - Chunk sections of assessment   - Allow for partial credit, when appropriate

Formative Assessments

Students are expected to keep an organized Engineering Design Notebook, folder, or binder. Designs and projects that are done on the computer will be submitted to Google Classroom and are still considered to be part of the student’s Engineering Design Notebook.
 	
1. Identifying the Problem
2. Research and Brainstorming
    a. “Car Crash Physics” - How it Works Google Classroom Assignment
    b. Car Crash fill-in-the-blank class notes
3. Materials Consideration Design Matrix
4. Thumbnail Sketch Design Matrix
5. Final Sketch of Desired Prototype
6. Build checkpoints
7. Testing and Modification Rationale
 	
Do-now’s and checkpoint quizzes will be given during and at the conclusion of these topics

Summative Assessments
Final Design Prototype Evaluations End of Unit checks on Design Journals, documenting: ● Problem statement ● Criteria and constraints ● Design process ● Digital Design Development ● Testing, Modification, and Improvements made Final presentation or design review (partners/small group) Written reflection explaining design decisions (individual)

Black Horse Pike Regional School District Curriculum

ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21ST CENTURY GLOBAL SKILLS

Unit Title:	Civil Engineering - Bridges + Intro to AutoCAD
Course:	Design & Technology I
Grade Levels:	9-12
Last Revision:	Summer 2026

Unit Overview
In this unit, students will use principles of mathematics and science to explore the technological systems involved in designing and constructing structures. Students will begin by researching mechanical forces, structural loads, material properties, and geometric shapes that influence structural performance. They will then apply their knowledge by experimenting with and testing bridge designs using computer-based simulations. After identifying an effective bridge design, students will recreate their structure using digital design software before fabricating and assembling a physical model. The unit will culminate with students testing their completed bridges and evaluating the effectiveness of their designs based on performance data.

Essential Questions	**Enduring Understandings**
How can we study real-world structures to help in this challenge?	Students can study real-world designs, like bridges, trusses, and similar structures to understand how designers use limited resources, materials, and creative problem-solving to overcome challenges. By analyzing existing products and structures, students can identify design strategies that can be applied to their own structure.
How do physics concepts, like compression, tension, live and dead loads, etc. impact a structure?	Physics concepts determine how a structure supports, transfers, and resists forces. Engineers must understand these concepts to design structures that are strong, stable, safe, and efficient. Every bridge, building, or tower experiences a variety of forces and loads, and the way those forces interact affects the structure's performance.
When designing a structure, what are some of the advantages of designing in a digital design software, like AutoCAD?	AutoCAD is a staple in Engineering, Design and Architecture fields. Digital tools like AutoCAD allow engineers and architects to design more accurately, efficiently, and collaboratively while reducing errors and costs.
What are some advantages of using computer software and models to test designs throughout the design process?	Using computer software and digital models throughout the Engineering Design Process allows engineers to explore ideas, test performance, and improve designs before investing time and resources in building physical prototypes.

Learning Targets/Goals/Outcomes	Standards (NJSLS)
Research existing, real-world structures and apply similar geometric shapes to designs for this challenge.	8.2.12.NT.1 8.2.8.ED.3 CTE - 9.3.12.AC-DES.1
Research existing, real-world structures and consider how physics can impact a structure.	8.2.12.NT.1 8.2.8.ED.3 CTE - 9.3.12.AC-DES.1
Brainstorm and generate multiple ideas using the information gathered while researching the Design Challenge.	8.2.12.ED.1 8.2.2.NT.2 8.2.5.ED.2
Evaluate brainstormed ideas based on their effectiveness, safety, cost, materials, and feasibility, as well as how they relate to the criteria and constraints outlined on the Design Brief.	8.2.12.ED.1 8.2.2.NT.2 8.2.5.ED.2 CTE - 9.3.12.AC-CST.3
Use computer software, like West Point Bridge Designer, to test the effectiveness of multiple, varied, designs.	8.2.5.ED.6 8.2.12.ED.6
Using a digital design software, like AutoCAD, create a working design of a structure that can be used as a blueprint template.	8.2.8.ED.3 CTE - 9.3.12.AC.6
Construct a working model of a structure that can be tested for efficiency.	8.2.5.ED.6

Interdisciplinary Connections
Science (HS-PS3-1), Math & Statistics (S-ID.5–6)

21st Century Skills
In this unit, students continue to develop critical thinking skills, creativity, collaboration, communication, and problem-solving. Using the Engineering Design Process, students learn to analyze challenges, develop innovative solutions, create prototypes, and refine designs based on testing and feedback.

Writing Assignments
• Sketching Assignments • Reflection Assignments • Individual and/or group Presentations

Vocabulary - List Tier 2 (Academic Essentials)	Vocabulary - Tier 3 (Content-Specific)
• Civil and Structural Engineering • Compression • Tension • Load-Bearing • Force	• Civil Engineering • Structural Engineering • Feasibility • Sustainability • Simulation

• Dead and Live Loads • Torsion • Shear	• Trade-off • Load Capacity • Beam • Column • Arch • Truss • Span • Foundation • Cross Section

Activities, Instructional Strategies, and Assignments

- Project based and self-exploration activities
- Real life digital design challenges, assessments, and projects
- Teacher guided instruction
- Lectures
- Multiple Visual Examples
- Question and Answer
- Whole class reviews, check-ins, and student-led presentations
- Independent, self-paced learning
- Collaborative group (partner) design challenges
- Do-nows
- Exit Tickets

Accommodations and Modifications (BHPRSD Accommodations and Modifications)

- Provide a variety of concrete examples from familiar contexts
- Build background knowledge of content and vocabulary from familiar contexts prior to readings
- Use mental models to build understanding through familiar contexts
- Provide oral & written instructions
- Incorporate multimedia/audio visual representation (YouTube, Discovery Education, TV Show parodies, etc.) to build understanding
- Use graphic organizers to guide notes, brainstorming, pre-writing, project planning, and test preparation
- Model through processes during assignments and elicit student-generated thoughts to determine gaps in understanding
- Highlight, bold, or underline main ideas in readings and in directions for writing assignments in the curricular areas
- Provide guiding questions to complete during the activity
- Use multiple intelligences or the student's learning style to facilitate effective learning when a student is having difficulty grasping concepts
- Provide demonstrations, utilize pictures, or graphic to assist visual learners to support written text information
- Include oral discussions, oral presentations, group collaboration, or other oral delivery methods to support auditory learners
- Provide chunking of assignments into manageable steps, including checklists that clarify directions for assignments
- Provide a clear, concise version of a scoring rubric prior to the assignment or assessment
- Highlight distinctive features/key concepts
- Provide choice of projects depending on the student’s interests or strengths.
- Review, repeat, and clarify directions

Formative Assessments

Students are expected to keep an organized Engineering Design Notebook, folder, or binder. Designs and projects that are done on the computer will be submitted to Google Classroom and are still considered to be part of the student's Engineering Design Notebook.
 	
1. Identifying the Problem
2. Research and Brainstorming
    a. Bridge Physics fill-in-the-blank class notes
    b. Bridge Sketches and Preliminary Designs
3. Preliminary Sketches - Design Matrix
4. West Point Bridge Designer - 3 Bridge Designs
5. AutoCAD - Final Design
6. Build checkpoints
    a. First half of the bridge
    b. Second half of the bridge
7. Testing and Modification Rationale
 	
Do-now's and checkpoint quizzes will be given during and at the conclusion of these topics

Summative Assessments
Final Design Prototype Evaluations End of Unit checks on Design Journals, documenting: ● Problem statement ● Criteria and constraints ● Design process ● Digital Design Development ● Testing, Modification, and Improvements made Final presentation or design review (partners/small group) Written reflection explaining design decisions (individual)

Black Horse Pike Regional School District Curriculum

ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21ST CENTURY GLOBAL SKILLS

Unit Title:	Rocketry and Aeronautics
Course:	Design & Technology I
Grade Levels:	9-12
Last Revision:	Summer 2026

Unit Overview
For the final unit of the year, students will participate in a hands-on and engaging design challenge focused on rocket design and flight. Students will continue to apply the Engineering Design Process as they research the principles of flight and use their knowledge to design and create an aerodynamic rocket using digital design software such as Fusion. Students will then fabricate, test, and analyze their rocket designs, using flight data to make modifications and improvements. The unit will culminate with students competing to achieve the greatest flight altitude while demonstrating their understanding of aerodynamics, engineering design, and iterative improvement.

Essential Questions	**Enduring Understandings**
How can we study real-world rockets, planes, and principles of flight to help in this challenge?	Students can study real-world rockets, aircraft, and the principles of flight to understand how engineers use aerodynamics, stability, propulsion, and material selection to design vehicles that fly safely and efficiently. By analyzing existing aerospace technologies, students can identify design strategies that can be applied to improve the performance of their own model rockets.
What are some advantages of using computer software and models to test designs throughout the design process?	Using computer software and digital models throughout the Engineering Design Process allows engineers to explore ideas, test performance, and improve designs before investing time and resources in building physical prototypes.
What is the importance of many technological systems working together as a whole?	The success of the design depends on how multiple systems interact to safely absorb and distribute the forces of a collision, as no single part of the vehicle can protect the egg on its own.

Learning Targets/Goals/Outcomes	**Standards (NJSLS)**
Research existing, real-world rockets and aircrafts and apply similar geometric shapes, particularly to the fins, to designs for this challenge.	8.2.12.NT.1 8.2.8.ED.3 CTE - 9.3.12.AC-DES.1
Research existing, real-world rockets and aircrafts and consider how physics can impact the rockets in this Design Challenge.	8.2.12.NT.1 8.2.8.ED.3 CTE - 9.3.12.AC-DES.1

Brainstorm and generate multiple ideas using the information gathered while researching the Design Challenge.	8.2.12.ED.1 8.2.2.NT.2
Using digital design software, like AutoCAD and/or Onshape, create a working design of the model rocket that can be used as a blueprint template.	8.2.8.ED.3 CTE - 9.3.12.AC.6
Construct a functional, fully assembled, working model of a rocket that can be launched and tested for things like: center of gravity, center of pressure, flight, and altitude.	8.2.5.ED.6 CTE - 9.3.12.AC-CST.3

Interdisciplinary Connections
Science (HS-PS2-1, HS-PS2-1, HS-PS3-1, HS-PS3-3), Math (G-MG.1)

21st Century Skills
In this unit, students continue to develop critical thinking skills, creativity, collaboration, communication, and problem-solving. Using the Engineering Design Process, students learn to analyze challenges, develop innovative solutions, create prototypes, and refine designs based on testing and feedback.

Writing Assignments
• Sketching Assignments • Reflection Assignments • Individual and/or group Presentations

Vocabulary - List Tier 2 (Academic Essentials)	**Vocabulary - Tier 3 (Content-Specific)**
• Aerodynamics • Lift • Drag • Thrust • Air Resistance • Acceleration • Velocity • Trajectory • Stability • Equilibrium • Turbulence • Pressure • Surface Area	• Airframe • Body Tube • Nose Cone • Payload • Fins • Propellant • Shock Cord • Center of Gravity (CG) • Center of Pressure (CP) • Stability

Activities, Instructional Strategies, and Assignments
- Project based and self-exploration activities   - Real life digital design challenges, assessments, and projects   - Teacher guided instruction   - Lectures   - Multiple Visual Examples   - Question and Answer   - Whole class reviews, check-ins, and student-led presentations   - Independent, self-paced learning   - Collaborative group (partner) design challenges   - Do-nows   - Exit Tickets

Accommodations and Modifications (BHPRSD Accommodations and Modifications)
- Provide a variety of concrete examples from familiar contexts   - Build background knowledge of content and vocabulary from familiar contexts prior to readings   - Use mental models to build understanding through familiar contexts   - Provide oral & written instructions   - Incorporate multimedia/audio visual representation (YouTube, Discovery Education, TV Show parodies, etc.) to build understanding   - Use graphic organizers to guide notes, brainstorming, pre-writing, project planning, and test preparation   - Model through processes during assignments and elicit student-generated thoughts to determine gaps in understanding   - Highlight, bold, or underline main ideas in readings and in directions for writing assignments in the curricular areas   - Provide guiding questions to complete during the activity   - Provide chunking of instructional notes and activities to allow for formative assessment (checks for understanding) before moving on to the next stage   - Choose cooperative learning groups to ensure effective work, maximize productivity and support socialization   - Use multiple intelligences or the student's learning style to facilitate effective learning when a student is having difficulty grasping concepts   - Provide demonstrations, utilize pictures, or graphic to assist visual learners to support written text information   - Include oral discussions, oral presentations, group collaboration, or other oral delivery methods to support auditory learners   - Provide chunking of assignments into manageable steps, including checklists that clarify directions for assignments   - Provide a clear, concise version of a scoring rubric prior to the assignment or assessment   - Highlight distinctive features/key concepts   - Provide choice of projects depending on the student’s interests or strengths.   - Review, repeat, and clarify directions   - Chunk sections of assessment   - Allow for partial credit, when appropriate

Formative Assessments

Students are expected to keep an organized Engineering Design Notebook, folder, or binder. Designs and projects that are done on the computer will be submitted to Google Classroom and are still considered to be part of the student's Engineering Design Notebook.
 	
1. Identifying the Problem
2. Research and Brainstorming
    a. Principles of Flight fill-in-the-blank class notes
    b. Fin and Nose Cone Sketches and Preliminary Designs
3. Preliminary Sketches - Design Matrix
4. Digital Design Model of Fins (Onshape, Fusion, and/or AutoCAD)
5. Build checkpoints
    a. Body Tube
    b. Nosecone
    c. Fins
6. Testing, Evaluation and Modification Rationale
 	
Do-now's and checkpoint quizzes will be given during and at the conclusion of these topics

Summative Assessments
Final Design Prototype Evaluations End of Unit checks on Design Journals, documenting: ● Problem statement ● Criteria and constraints ● Design process ● Digital Design Development ● Testing, Modification, and Improvements made Final presentation or design review (partners/small group) Written reflection explaining design decisions (individual)